OPERATION AND SERVICE MANUAL

MODEL 8500

CABLE LOCATOR/FAULT FINDER®

SERIAL NUMBER 1504

ASSOCIATED RESEARCH, INC.
905 CARRIAGE PARK AVENUE
LAKE BLUFF, IL 60044 U.S.A.
PHONE 1 (708) 295-3312
FAX: 1 (708) 295-9165

FOR TECHNICAL ASSISTANCE
PHONE: 1 (800) 858-TEST

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SECTION I

OPERATORS MANUAL

SAFETY

The Test Operator must follow all accepted safety practices, proceed with caution and do all in his power to assure a safe test.

Because of the inherent dangers in any High Voltage work, special care must be taken to safeguard personnel during any testing or fault finding.

GENERAL

Regardless of the type of test to be made or fault to be found, certain preliminary steps should precede the actual test. First, open all switches and breakers to de-energize the cable or equipment and isolate the item. Using a hot stick and rubber gloves, ground all sections of the test item to insure that it is not charged.

Careful advance planning is essential to a proper and safe test. Proper test equipment, ground leads, high voltage cables, hot stick, rubber gloves and any other special tools should be assembled at the test site.

The equipment to be tested should be de-energized, *properly grounded and disconnected. Cables to be tested should be de-energized, *properly grounded, and isolated from other components such as switch gear, transformers, lightning arrestors, etc. Both ends of a cable to be tested should be disconnected and protected to safeguard passing personnel. The conductors at the far end of a cable should be separated and taped to avoid external flash over or leakage during the test.

A man should be stationed at any point where the test item is accessible to unauthorized people and barriers should be erected. Signs should be posted that read "DANGER - HIGH VOLTAGE TEST IN PROGRESS, KEEP AWAY". Do not use terms such as "Kilovolts", "KV: or "HV" because the average person does not understand the true meaning of these terms or abbreviations.

Decide upon the proper test procedure to be followed before starting the test.

HIGH VOLTAGE TESTING

After making any test turn the High Voltage switch off and return the voltage control to zero or minimum position, check the kilovoltmeter for a zero indication (on DC test the capacitive element of the test item will hold a charge and may take a long time to discharge) and *ground the test item before disconnection. After a DC test has been performed the ground should be left on the item for at least as long as the total time high voltage was applied to prevent a voltage build up due to absorption current. It is best to leave a ground on a test item any time it is not in service or undergoing a test.

*Any time a ground is to be placed on a circuit it should first be grounded with a hot stick and rubber gloves. All circuits not in use (or connected to a guard or bypass circuit) should be grounded.

FAULT FINDING

Make an insulation resistance test on the faulted cable between the conductor and ground, shield or housing before testing on both ends of a cable to determine the condition of the fault. Consider all the factors effecting the faulted cable, such as the resistance of the fault, the age of the cable, the condition of the ground (if buried), the humidity, the voltage rating of the cable, etc. and decide on the best test method or methods to be used.

FAULT FINDING - Cont.

Because of the heavy pulse current (possibly thousands of amperes) generated with capacitance discharge equipment, it is absolutely essential that careful attention be paid to proper grounding and safety practices. The test equipment should be tied to a good earth ground with as short and heavy a connection as possible. The unused phases of a multi-phase cable and the sheath or neutral should also be tied to this same ground.

EQUIPMENT GROUNDING INSTRUCTIONS

It is absolutely essential for safety of operating personnel as well as for proper operation of the test equipment, that the equipment be effectively grounded. Effectively grounded, as defined in the national electrical code, means "..... connected to earth through a ground connection of sufficiently low impedance and having sufficient ampacity to prevent the building up of voltage which may result in undue hazard to connected equipment or to persons."

Depending on the power input requirements, some instruments may be equipped with a power input cable having a three-prong grounding type plug, a two-prong plug with grounding clip, or a three conductor cable terminating in lugs (where one lug is for ground connection). In any case an effective ground connection must be provided.

Where a three-prong grounding type plug is used, the equipment will be grounded through the ground prong provided that the receptacle itself is effectively grounded through a low impedance ground connection.

On instruments equipped with a two-prong plug and grounding clip, a three conductor line cord terminated in lugs, or where a two-prong adapter is used on a three-prong plug, the grounding clip or lead must be connected to a low impedance earth ground. For a low impedance earth ground, a continuous metallic underground water system may be used for ground connection. Where this is not available a driven ground rod may be used to provide an effective earth ground. In either case the resistance to ground of the piping system or driven ground rod should not exceed 25 ohms as required by the National Electrical Code.

Some instruments are equipped with a safety ground terminal in addition to the grounding conductor in the line cord. This terminal should be connected to an auxiliary grounding electrode, having low impedance, such as a piping system or driven ground referred to above. This terminal should be connected to ground with heavy wire.

If test equipment is being used in the field where input power is provided by a gasoline engine driven alternator, generator, or a battery operated converter, it is essential that not only the test equipment but also the metallic framework or housing of the power source be grounded.

Failure to comply with the above equipment grounding instructions could result in dangerous electrical shock to operating personnel.

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SPECIFICATIONS

MODEL:	8500A CABLE LOCATOR/FAULT FINDER
CASE:	19" x 12-1/4" x 6-1/2" Aluminum suitcase style case housing Transmitter, Detector and accessories.

TRANSMITTER

INPUT:	105-125 volts AC. 50/60 HZ, 1 phase, 1.5 amperes, 175 Watts, through ten foot three conductor line cord terminated in standard three-prong grounding type plug.
FAULT FINDING SECTION OUTPUT CURRENT:	Adjustable from 0-100 milliamperes DC steady or polarity reversing.
OUTPUT CURRENT METER:	100-0-100 milliamperes DC.
OUTPUT VOLTAGE:	Open circuit voltage of 1000 volts DC.
CABLE LOCATING SECTION AUDIO OUTPUT:	Pulse modulated tone signal for locating cable and opens within the cable.
OUTPUT TERMINATION:	HIGH VOLTAGE and GROUND terminals.

DETECTOR

INPUT:	9 volts DC self-contained battery with circuit for checking battery condition.
CONTROLS:	VOLUME, METER, PEAK-NULL -45°, BATTERY CHECK and GROUND CURRENT switches.
DIMENSIONS:	3-11/16" x 6-1/2" x 2-3/8".
TERMINATION:	Probe receptacle, ground terminal, and phone jack.
CARRYING CASE:	Leatherette carrying case for detector.
ACCESSORIES PROBE:	1-1/8" x 1-1/8" x 10" search coil tapped for ground spike and mounted to 33 inch two section handle. Terminated in quick disconnect connector. This single probe provides peak, null and 45° modes of operation.
EARPHONES:	Dual headphones with foam ear cushions and an adjustable head band.
GROUND SPIKE:	Two 16-3/4" long steel copper clad "T" handle spikes.
CABLE:	15 foot output cables terminated in insulated clips and spade lugs, and a 25 foot detector ground cable.
INPUT ADAPTER CABLE:	2-1/2 ft. cable with crocodile clips at one end for connection to available 115 VAC power where receptacles are not provided. Other end has standard receptacle.

CARRYING CASE: 8" x 3-3/4" leatherette carrying case for detector.

WEIGHTS

TRANSMITTER--------	18-1/2 lbs.	PROBE----------	2-1/4 lbs.
DETECTOR W/CASE----	1-1/2 lbs.	GROUND SPIKE (TWO)---	1-1/2 lbs.
HEADPHONES---------	3/4 lb.	CABLES----------	1-1/2 lbs.

TOTAL UNIT------ 25-1/2 lbs.

SECTION II

GENERAL FEATURES

The Model 8500 Cable Locator/Fault Finder, as the name implies, may be used to trace the path of a buried cable as well as to pinpoint the location of a fault.

As a fault finder, it is particularly suited to finding grounds or low resistance faults in residential underground service or other unshielded buried cable. However, because of the many modes of operation available, it is usually very effective even with lead sheathed or unshielded cable, or cables having high resistance or open circuit faults. It will work well on cables buried under asphalt, concrete, or top soil, buried to depths of several feet.

As a cable locator, the Model 8500 works on almost any buried cable, whether shielded, unshielded or lead sheathed, buried to depths of five or six feet.

TRANSMITTER

INPUT

The input is a three conductor cable which is terminated in a standard three prong grounding type plug. The input is protected by a fuse (two on 230 V. models) in series with the input cable. Should an overload occur, the fuse will open; the cause should be investigated.

CABLE LOCATOR

The CABLE LOCATOR switch turns the powerful pulse modulated audio oscillator and the CABLE LOCATOR indicator on. This distinctive tone signal is readily discernable even in areas of high interference. This signal may be used alone to locate the path of the cable, or it may be superimposed on the high voltage output to trace the cable's path, so that cable locating and fault finding may be carried on simultaneously.

FAULT FINDER

The input power to the high voltage power supply and reversing circuit is controlled by the FAULT FINDER switch.

The output current, as indicated on the milliammeter, is adjusted by the OUTPUT CURRENT control which feeds the primary of the high voltage power supply. The polarity of the output is normally positive to ground, but with the OUTPUT CURRENT REVERSING/STEADY switch in the REVERSING position the polarity of the output is reversed about every 1-1/2 to 2 seconds. This periodic reversing of the output current, through the fault, overcomes the effects of strong stray ground currents.

OUTPUT TERMINALS

The output from both the audio oscillator and the high voltage power supply is taken between the GROUND and HIGH VOLTAGE terminals. The GROUND terminal is connected to the case and the ground prong on the input cable.

DETECTOR

The Detector is powered by a standard 9 volt battery which is good for many hours of operation. To conserve power and prevent accidentally leaving it on, the unit is automatically turned off when the probe is disconnected.

The high gain amplifier is a combination of an integrated circuit power amplifier and a transistorized pre-amplifier to drive the high quality headphones.

BATTERY CHECK

With the probe connected, the battery condition can be checked by pushing the BATTERY CHECK switch. The GROUND SIGNAL meter will deflect from center scale (5) to the right, indicating either O.K. or REPLACE.

BATTERY REPLACEMENT

Remove the four (4) screws on the rear of the detector and remove the cover. Change the battery and replace the cover and the four (4) mounting screws.

CABLE LOCATING

The pulse modulated audio signal from the transmitter is radiated from the cable under test, and picked up by the probe, which is connected to the PEAK/NULL/45^{o} switch. This switch selects the desired mode of operation (see PROBE section of this manual), the output of which is coupled to the audio amplifier. The amount of signal being applied to the headphones is adjusted by the VOLUME control (minimum output with the control at its maximum counter-clockwise position).

FAULT FINDING

The GROUND SIGNAL metering system is connected between the spike on the end of the probe and the GROUND terminal on the detector. With the GROUND terminal connected to a referenced ground spike and the probe spike stuck in the ground over the cable under test, the leakage signal from the transmitter can be read. The sensitivity of the GROUND SIGNAL meter is adjusted by the METER control (minimum sensitivy maximum counter-clockwise position). This control should always be left in the minimum sensitivity position when not in use.

With the GROUND CURRENT switch in the NORMAL position, all ground signals will be indicated by the meter. Steady state ground currents can cause the meter to deflect to either the left or the right, making the

DC signal from the transmitter unidentifiable. Placing the switch in the CANCEL position will cause the metering system to reject the steady state currents and accept only the reversing DC signal from the transmitter.

NOTE: The transmitter OUTPUT CURRENT switch must be in the REVERSING position when the CANCEL circuit is used.

PROBE

Because of a unique design, a single probe can be used for PEAK, NULL and 45° modes of operation. The operator needs only to turn a switch to change modes.

A detachable spike screws into the head of the probe for making ground signal measurements.

PEAK MODE

The PEAK MODE is used to trace the path of the cable under test by giving a maximum audio signal when the probe head is crosswise and centered (note arrow on probe) on the cable. As the probe is moved to either side of the cable (at right angles to the cable) the audio signal will decrease.

In case of an outright break or complete open circuit in the cable, the audio oscillator may be used for fault finding, as well as cable locating, since the signal will either disappear completely or decrease after the break has been passed.

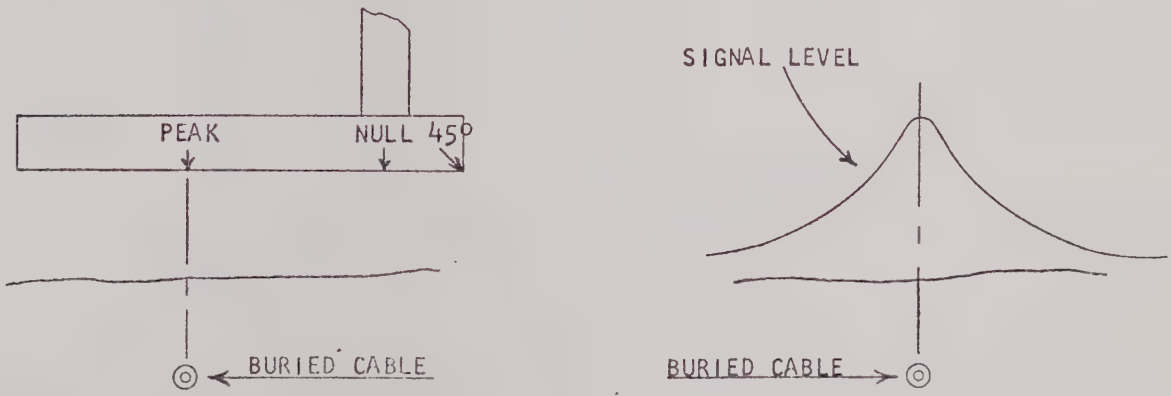


FIGURE 1

NULL MODE

The NULL MODE is used to trace the cable under test by giving a null (minimum audio signal) in the audio signal when the probe handle (note arrow) is directly over the cable under test. As the probe is moved from one side of the cable to the other, the audio signal will increase, see Figure 2. The probe must always be held in a vertical position.

The NULL MODE can be used to locate opens in the cable by tracing the cable's path to the open. At this point the null will broaden and become unidentifiable.

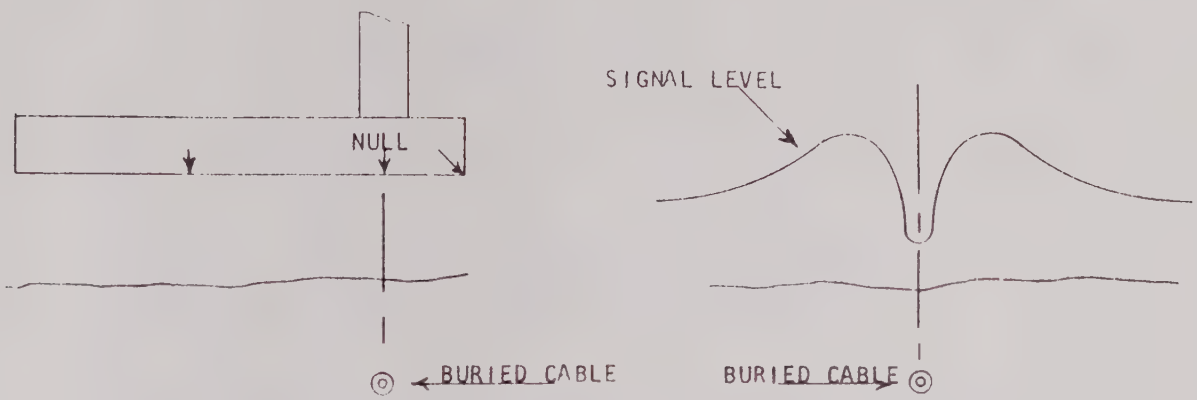


FIGURE 2

45° MODE

To determine the approximate depth of a cable, a combination of the NULL and 45° modes is used. The cable location is first pinpointed by using the NULL MODE and marked. Then in the 45° mode the probe is moved away from the null point (at right angles to the cable), with the head of the probe pointing away from the cable (see Figure 3) until a null is noted in the signal. The distance from the first null to the second null is the approximate depth.

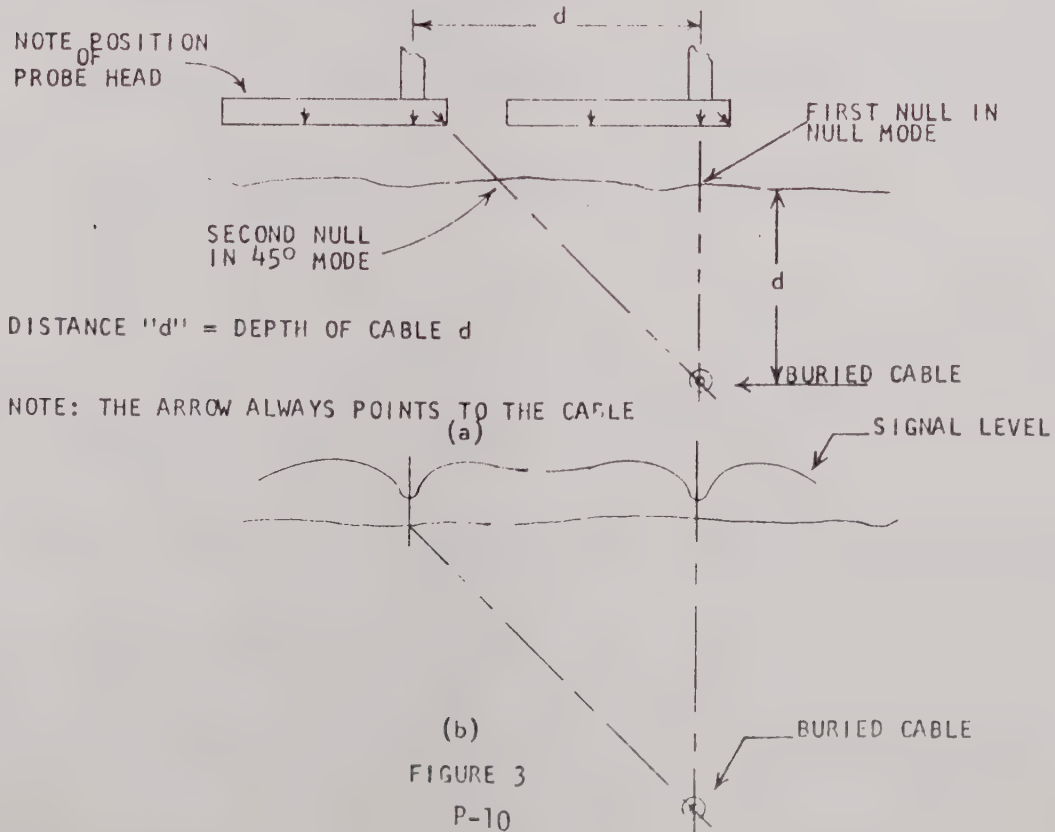


FIGURE 3

SECTION III

INSTRUMENT OPERATION CHECK

TRANSMITTER

1. Turn the CABLE LOCATER and FAULT FINDER switches OFF.

2. Rotate the OUTPUT CURRENT control to its minimum position and place the switch in the STEADY position.

3. Connect the output leads to the unit and clip them together.

4. Turn the CABLE LOCATER ON - the milliammeter should pulsate. Turn the switch OFF.

5. Turn the FAULT FINDER ON and slowly rotate the OUTPUT CURRENT control to its maximum position. The milliammeter should read approximately 100 MA. Placing the switch in the REVERSING position should cause the milliammeter to reverse about every 1-1/2 to 2 seconds. Turn the switch OFF.

6. Unclip the output leads and turn the CABLE LOCATER ON.

DETECTOR

7. Rotate the METER and VOLUME controls to their maximum counter-clockwise position and turn the PEAK/NULL/45° switch to the PEAK position. Place the GROUND CURRENT switch in the NORMAL position.

8. Screw the spike into the probe head and plug the probe and headphones into the detector. Check the detector battery by pushing the BATTERY CHECK switch.

9. Lay the probe on the output leads of the transmitter and slowly rotate the VOLUME control clockwise, noting the audio signal.

10. Turn OFF the CABLE LOCATER.

11. Connect a 1.5 volt battery between the GROUND terminal and the probe spike.

12. Slowly rotate the METER control clockwise noting the GROUND SIGNAL meter deflection. The meter should indicate end scale when the control is approximately 50% of its rotation (reversing the polarity of the battery should cause the meter to read in the opposite direction).

    CAUTION: DO NOT over drive the meter and DO NOT connect the battery before turning the METER control to its full counter-clockwise position.

13. Place the GROUND CURRENT switch in the CANCEL position. The meter should slowly return to center scale.

14. This completes the check-out procedure. Disconnect the 1.5 volt battery and the probe.

SECTION IV

SPECIAL TEST CONDITION AND CONSIDERATIONS

The conditions described in this section are given only as aids to using the instrument and not necessarily as exact testing methods.

DISCONNECT ALL CABLES AND SHIELDS

Where possible, disconnect the neutral, all shields, and any other cable in the same trench so as not to introduce false signals. If other cable(s) in the same trench are connected, the leakage current through the fault may be returned by way of the other cable and not through the ground. If the cable under test is shorted to its shield and the shield is connected to the system ground, the leakage current through the fault to the shield and system ground will not be returned through the earth and very low or no ground signal will be indicated.

TRANSMITTER GROUND CONNECTION

The GROUND terminal on the Transmitter should never be connected to the base of a light pole, pad mounted transformer or any ground system that is in the general area of the cable under test. High ground currents are concentrated in these areas and will give false indications. The ground spike connected to the GROUND terminal should always be driven into the ground fifteen to twenty feet, to one side of and at right angles to the cable.

LOCATION OF DETECTOR GROUND SPIKE

The Detector Ground Spike should not be near the Transmitter Ground because of the concentration of ground current around that point.

Best results are usually obtained with the Detector Ground on the same side of the cable as that of the Transmitter.

HIGH RESISTANCE FAULTS

Many faults appear to be high resistance but actually it is the soil that has a high resistance, not the fault. If the soil is very dry, watering down the area directly over the cable will increase the readings. It is also advisable to soak the area around the ground spike. If, after watering the area, no current flow is indicated by the Transmitter, the resistance is too high and beyond the limits of the unit.

LOW RESISTANCE FAULTS

Under some conditions a very low resistance fault can be found with the tone signal by using the PEAK MODE. The tone signal will noticeably decrease when the fault is passed.

In areas of very low ground currents, the steady mode of operation may be used with a low resistance fault. The GROUND SIGNAL meter will show a steady deflection, gradually increasing as the fault is reached and maximum when the probe is directly over the fault.

OPENS (NO SHORT TO GROUND)

An open can be found by using the audio signal alone. The audio signal is coupled through the capacitance of the cable to ground. The H.V. output terminal must be connected to the current carrying conductor insulated from ground. When the PEAK MODE is used, the cable path is traced following the maximum signal. When the open is passed, the signal will decrease noticeably and normally the maximum signal will broaden.

When the NULL MODE is used, the cable path is traced by noting the null in the audio signal. As the open is passed, the null will broaden and become unidentifiable.

Oftentimes the Peak Mode is used to find the general area of the open, and then the Null Mode is used to narrow that area.

MULTIPLE FAULT INDICATIONS

Under some conditions several indications of faults are noted, but the signals at these fault indications are relatively small. These indications normally are caused by the current flowing through the fault into the ground, crossing the cable as it returns to the Transmitter ground. Mark these locations and connect the Transmitter to the other end of the cable. If the fault indications repeat, there is a fault at that point. Under some conditions it is not practical to test from the other end, so move the Transmitter ground to the other side of the test cable and repeat the test. Any spots that repeat are normally faults, but it is best to repair the strongest (if more than one) first and repeat the test. When one fault is found and fixed, these other indications will disappear, unless, of course, there is another weak spot in the cable insulation.

LOCATING UNSHIELDED DIRECT BURIED CABLE

When locating a cable that does not have a fault, the audio level can be increased by grounding the cable at the end opposite the transmitter.

SHIELDED CABLE, FAULT FINDING & CABLE LOCATING

This unit was primarily designed to locate faults in unshielded, U.R.D. (600 volts or less), direct buried cable. It can be used on shielded cable also. The audio signal level will be reduced depending on the depth of the cable. The current through the fault will tend to flow along the shield rather than go through the earth. This is why normally the ground signal level as indicated by the detector may be very low or nonexistant until right over the fault. It is most important to have the Transmitter Ground at right angles to the cable and, if possible, 20 to 30 feet or more away from the cable. Do not connect the Transmitter Ground to the shield. Always disconnect the shield from system ground.

SHIELDED CABLE, LOCATING ONLY

Connect the GROUND terminal to the shield and the HIGH VOLTAGE terminal to a ground spike driven into the ground fifteen to twenty feet to one side, and at right angle to the cable under test.

CONCENTRIC NEUTRAL AND LEAD SHEATHED H.V. CABLE, FAULT FINDING & CABLE LOCATING

Normally this unit is not used for high voltage cable, but has been used successfully. By following the same methods described under shielded cable, the fault may be found.

The faults in high voltage cable are often very high resistance, therefore making it necessary to reduce the resistance before this unit can be used. This can be done by using a high voltage power supply and repeatedly breaking the fault down until its resistance is less than 1 megohm. If a thumper (capacitor discharge system) is available, this is excellent for lowering the resistance.

CONCENTRIC NEUTRAL AND LEAD SHEATHED H.V. CABLE - LOCATING ONLY

The connections should be the same as described under SHIELDED CABLE, LOCATING ONLY - except connect the GROUND terminal to the neutral or sheath.

LOCATING PIPE

Connect the GROUND terminal to the pipe. Connect H.V. terminal to a ground spike driven into the ground fifteen to twenty feet to one side and at right angle to the cable under test.

LOCATING CABLE IN STEEL CONDUIT

Use the same set up as described under LOCATING PIPE and connect the GROUND terminal to the conduit.

LOCATING ENERGIZED CABLES

To locate an energized cable, the GROUND terminal should be connected to the neutral. The H.V. terminal should be connected to a ground spike driven into the ground fifteen to twenty feet to one side and at right angle to the cable under test.

LOCATING ENERGIZED CABLE IN PLASTIC DUCT

Connections should be made the same as described under LOCATING ENERGIZED CABLES.

NO MILLIAMMETER INDICATION

No meter indication is usually because either the cable is not faulted to ground or the resistance of the fault is higher than 5 megohms.

FROZEN GROUND

When the ground is frozen, its resistance increases. Due to this increase in resistance, the ground signal may be very small or nonexistant until right over the fault. If the fault is of the high resistance type and in frozen ground, extra long ground spikes should be used for the Transmitter ground and Detector ground. A long spike should be driven into the ground over the cable at several points along the cable path. Con--

conect the spike on the probe to this spike and take a reading. By using the extra long spikes readings can be taken below freeze line.

Readings can be taken along the cable path and the fault found.

PINPOINTING THE FAULT

If the fault indication is not within a small area, moving the Detector ground spike so it is straight out from and at right anglesto the fault area will normally make the Detector much more selective. Any faulted cable should always be tested from both ends where practical. If a low signal is being received, watering down the area that indicates the fault will also aid in pinpointing the fault. Under some conditions, moving the Transmitter ground and Detector ground from one side of the cable to the other side will help.

CAUTION: NEVER move the Transmitter ground unless the FAULT FINDER and CABLE LOCATOR switches are off.

SECTION V

OPERATING INSTRUCTIONS

NOTE: These instructions are for cable locating and fault finding. For special conditions, see SPECIAL TEST CONDITIONS AND CONSIDERATIONS section of this manual.

TRANSMITTER

1. Disconnect both ends of the cable under test from line and load. If shielded, disconnect the shield from system ground.

2. Turn the CABLE LOCATER and FAULT FINDER switches OFF and rotate the OUTPUT CURRENT control to its MINIMUM position.

3. Connect the HIGH VOLTAGE terminal to the cable under test, and connect the GROUND terminal to a ground spike driven into the ground from 20 to 30 feet to one side of the cable.

4. Connect the INPUT cable to a proper source of power (if an adaptor is used, connect the ground lead to earth ground).

5. Turn the CABLE LOCATER and FAULT FINDER switches ON. Adjust the OUTPUT CURRENT control to feed approximately 50 milliamperes into the faulted cable. NOTE: If the fault in the cable has a low resistance, the output of the CABLE LOCATOR section may be indicated on the MILLIAMMETER.

6. Place the OUTPUT CURRENT switch in the REVERSING position.

DETECTOR

7. Connect the Detector GROUND terminal to a ground spike driven into the ground about 10 feet to one side of the cable (same side as Transmitter Ground).

8. Rotate the VOLUME and METER controls to their maximum counter-clockwise position. Place the GROUND CURRENT switch in the NORMAL position.

9. Plug the headphones in.

10. Screw the spike into the probe head and connect the probe to the Detector (this automatically turns the Detector ON).

11. Activate the BATTERY CHECK switch to check the battery condition. The GROUND SIGNAL meter should indicate O.K.

12. Select the desired mode of probe operation with the PEAK-NULL-45° switch.

13. Slowly wave the probe back and forth a few inches above the ground over the start of the cable and adjust the VOLUME control.

    The PEAK MODE will give the loudest tone when the probe is directly over and crosswise to the cable path (note arrow on probe).

The NULL MODE will give a null in the tone (minimum audio signal) when the probe handle is directly over the cable (note arrow on probe) and increases on either side (the probe must be held perpendicular to the ground).

The 45° MODE is used to determine the approximate depth of the cable, see GENERAL FEATURES section.

14. Walk along the cable path and poke the probe spike into the ground at several foot intervals, taking two or three readings at each point. Rotate the METER sensitivity control clockwise until a slow fluctuating signal is indicated by the GROUND SIGNAL meter (a left to right swing at about two second intervals). Adjust the METER control for a swing from approximately 2 to 8. If the meter indication is much higher in one direction than the other, the GROUND CURRENT switch should be placed in the CANCEL position. This will tend to equalize the meter swing (the CANCEL circuit will only function with the reversing output from the Transmitter).

    As the fault is approached, the magnitude of the meter swing increases (continue to adjust the METER sensitivity control to maintain the 2 to 8 reading) until it is at a maximum directly over the fault. As the fault is passed, the magnitude of the signal will decrease.

15. Once the fault has been found, its location should be marked and the Transmitter connected to the other end of the cable under test and rechecked from the opposite direction. This recheck will varify the fault and determine if there are other faults.

SECTION II

REPLACEMENT PARTS LIST

To order replacement parts, refer to the Replacement Parts List on the following pages. If you need assistance, call our Technical Support Hotline 1-800-858-TEST.

REPLACEMENT PARTS LIST

SYMBOL	PART NUMBER	DESCRIPTION
B-1	35335	Battery 9V snap
C-1,13	18454	Capacitor Paper
C-2,3,5, 11,12	18300	Capacitor Electrolytic 100 MF 50V
C-4	16658	Capacitor Paper
C-6	18301	Capacitor Electrolytic
C-7,10	17466	Capacitor Ceramic
C-8	18302	Capacitor Electrolytic
C-9	18498	Capacitor Electrolytic
C-14,15	18633	Capacitor Paper
C-16	10425	Capacitor Fixed Paper
C-501-2	18312	Capacitor Ceramic
C-503	18313	Capacitor Tantalum
C-504	18970	Capacitor Ceramic 10 MMFD 1KV
C-505-6	18945	Capacitor Tantalum
C-507	16360	Capacitor Ceramic
C-508	15915	Capacitor Disc 500 MMFD 500V
CA	33972	Cable Assembly, Return 15 ft. Black
CA	33973	Cable Assembly, Return 15 ft. Red
CA	16646	Cable Assembly Ground
CA-1	18376	Cable, Power
CN-501	17193	Jack Phono
F-1	50108	Fuse, Cart, 3A, 3AG
HP	17885	Head Phone
I-1,2	16437	Indicator Lamp
IC	18315	Integrated Circuit
L-501	17630	Choke, Fixed
M-1	18290	Meter DC Galvo
M-501	18291	Meter DC Galvo
NE-1	11812	Lamp Neon
Q-1,2	18559	Transistor
Q-501	18316	Transistor
		Resistor Variable 250K
R-1	16672	Resistor Fixed 24 ohm
R-2,3	16661	Resistor Fixed 470K
R-4	16787	Resistor Fixed 10 ohm
R-5	14812	Resistor Fixed 3.3K
R-6,12	17721	Resistor Variable 500 ohm
R-7,14	15294	Resistor Fixed 500 ohm 1/2W 1%
R-8,11,15,18	16787	Resistor Fixed 10 ohm 1/2W 10%
R-9,16	14791	Resistor Fixed 100K 1/2W 5%
R-10,17	17723	Resistor Variable 2.5K 1/4W
R-13	18273	Resistor Fixed 1.5K
R-19	58334	Resistor Fixed 10K
R-20,21	15911	Resistor Fixed 1K
R-22	16815	Resistor Fixed 270 ohm
R-501	18308	Resistor Variable 250K

SYMBOL	PART NUMBER	DESCRIPTION
R-502	18307	Resistor Variable 250K
R-503	18445	Resistor Fixed 1 Meg 1% 1/2W
R-504	18372	Resistor Fixed
R-505	18373	Resistor Fixed
R-506	18374	Resistor Fixed
R-507,509	18375	Resistor Fixed
R-508	18371	Resistor Fixed
R-510	18415	Resistor Fixed
RT-1,2	30299	Rectifier Silicon
RT-3,4 501-2	14503	Rectifier, Silicon, Low Voltage
RT-5,6	18329	Rectifier
RY-1,2	17910	Relay DC Volt Sense
RY-3	16568	Relay, DPDT, 115 V AC 10A
S-1,2	17911	Switch Toggle
S-3	59690	Switch Toggle SPST
S-502	15552	Switch Push Button Red
S-501	18310	Switch Rotary
S-503	15588	Switch Toggle
SCR-1,2	18311	Semiconductor
T-1	11654	Transformer Variable - Auto
T-2	18433	Transformer High Voltage
T-3	18294	Transformer Power 117V/24V
T-4	18304	Transformer Power 117V/28V
T-5	18328	Transformer Filament
T-6	16640	Transformer Auto
TR-1	11818	Terminal Post Red
TR-2	17478	Terminal, Return, Bypass, Nickel Plated

SECTION III

CALIBRATION PROCEDURE

12-17-71

MODEL 8500 - TRANSMITTER CALIBRATION PROCEDURE

NOTE: SEE DWG. B-10633 - SHEET 1 of 2 SCHEMATIC

1. Rotate all four calibration pots to the extreme CCW position.
2. Adjust the line input voltage to 105 V AC.
3. Set OUTPUT CURRENT switch to reversing position and CABLE LOCATOR switch to OFF.
4. If reversing relay, RY-1 is operating, leave R-6 and R-10 at extreme CCW position.
5. If reversing relay, RY-1 is not operating, rotate R-10 C.W. until RY-1 begins to operate.
6. Adjust R-6 to even OFF and ON time of relay.
7. Set OUTPUT CURRENT switch to STEADY POSITION and CABLE LOCATOR switch to ON position.
8. If audio modulation relay, RY-2, is operating leave R-12 and R-17 at extreme CCW position.
9. If audio modulation relay, RY-2 is not operating, rotate R-17 CW until RY-2 begins to operate.
10. Adjust R-12 to even ON and OFF time of relay.
11. Set OUTPUT CURRENT switch to REVERSING position to verify that both relays operate at 105 V AC input.
12. Increase the line input voltage to 115 V AC.
13. Set CABLE LOCATOR switch to OFF position.
14. Time reversing relay, RY-1, with stop watch or wrist watch for thirty (30) seconds. The average time per reverse should be between 1-1/2 and 2 seconds; use formula below.

$$\frac{\text{30 seconds}}{\text{number of reverses}} = \frac{\text{seconds}}{\text{reverse}}$$

The minimum number of reverses in 30 seconds = 15
The maximum number of reverses in 30 seconds = 20

15. If time does not meet specs, adjust R-10.
16. Connect frequency counter input across points E and F on 18295 oscillator assembly.
17. Preset counter to zero and turn CABLE LOCATOR switch ON for 30 seconds. Then divide counter indication by 30 seconds.

$$\frac{\text{counter indication}}{\text{30 seconds}} = \frac{\text{cycles}}{\text{second}}$$

(Continuation of Step 17)

The maximum number of cycles per second is 4 Hz.
The minimum number of cycles per second is 2 Hz.

18. If operation does not meet specs, adjust R-17.

FINAL CALIBRATION FOR 8500 CABLE LOCATOR

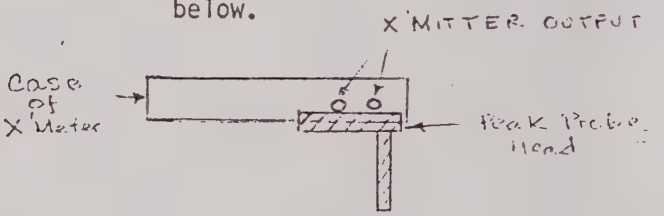
STEP 1 - Make mechanical inspection of detector, probe, cable assembly, headphone.

STEP 2 - Zero detector meter and XMITTER meter.

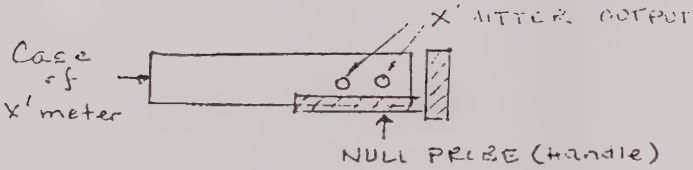
STEP 3 - Plug headphone and probe into detector.

STEP 4 - Depress battery check button on detector to insure battery is good.

STEP 5 - Turn cable locator switch of XMITTER on and position probe as illustrated below.

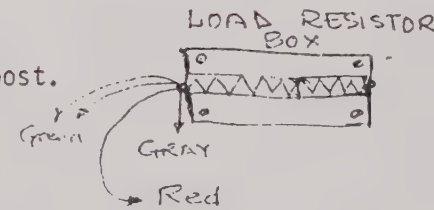


When detector is in peak position, a loud audio sound should be present. In NULL position audio should decrease and in 45 audio should once again increase.



When detector is in NULL position, a loud audio sound should be present. In 45 position audio should decrease some and in peak position audio should be weak.

FAULT FINDER



STEP 6 - Connect load as follows:
a) Green clip lead to XMITTER ground terminal post.
b) Green lug lead to detector ground post.
c) Red lead to XMITTER H.V. terminal post.
d) Gray lead to top screw on probe head.

STEP 7 - Adjust controls of detector as follows:
a) METER knob maximum clockwise.
b) Cancel - NORMAL ground current switch to normal.

STEP 8 - Adjust output current knob on XMITTER to 50 on XMITTER METER. (Detector METER should be between 9.5 and 10.)

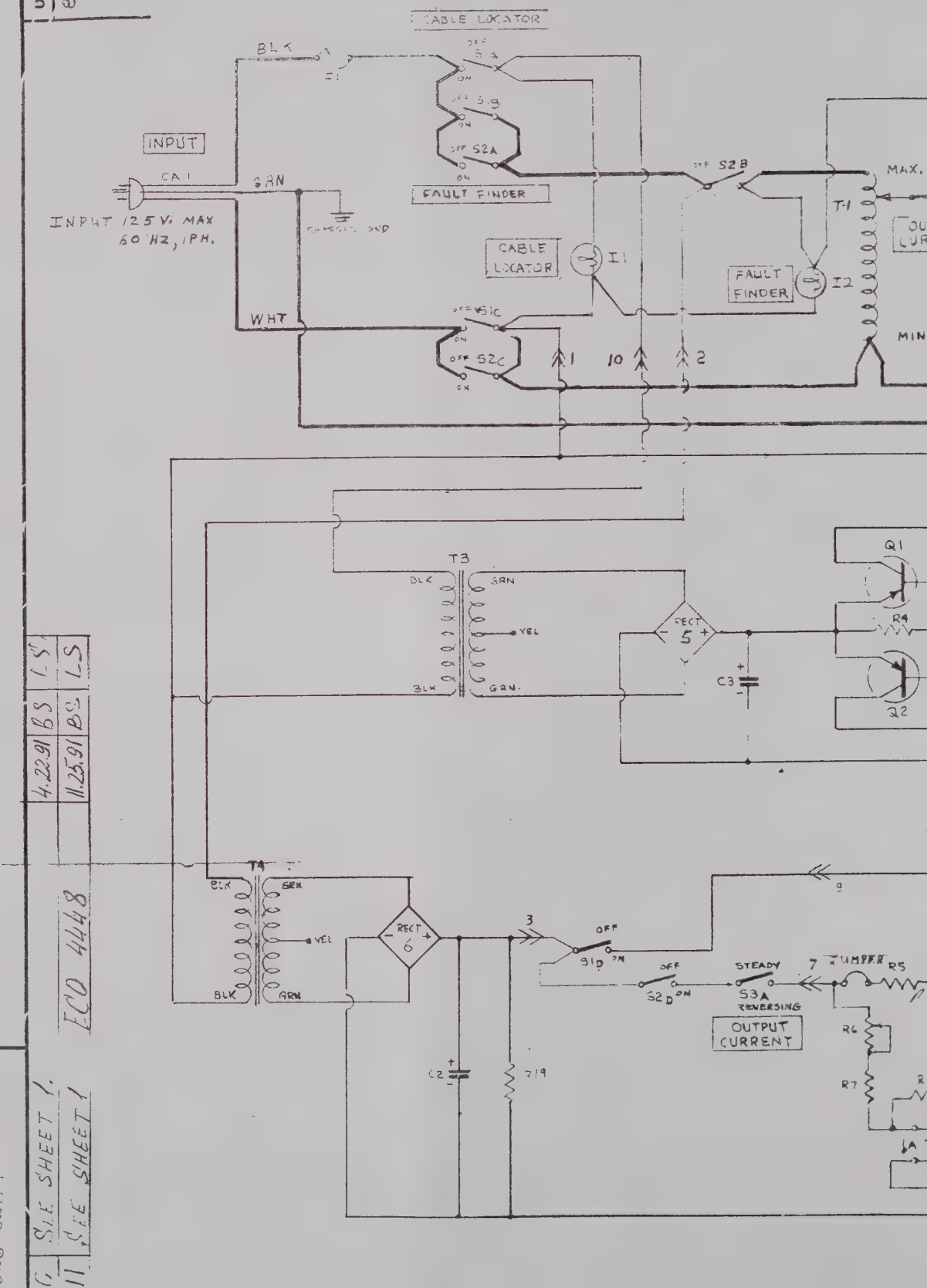
STEP 9 - Switch cancel - NORMAL ground current switch to cancel. (METER indication on detector should decrease slowly.)

STEP 10 - Switch reversing - STEADY switch on XMITTER to reversing and observe reversing in same direction of XMITTER METER and detector meter.

SECTION IV

SCHEMATIC

USED ON
8550-3.1



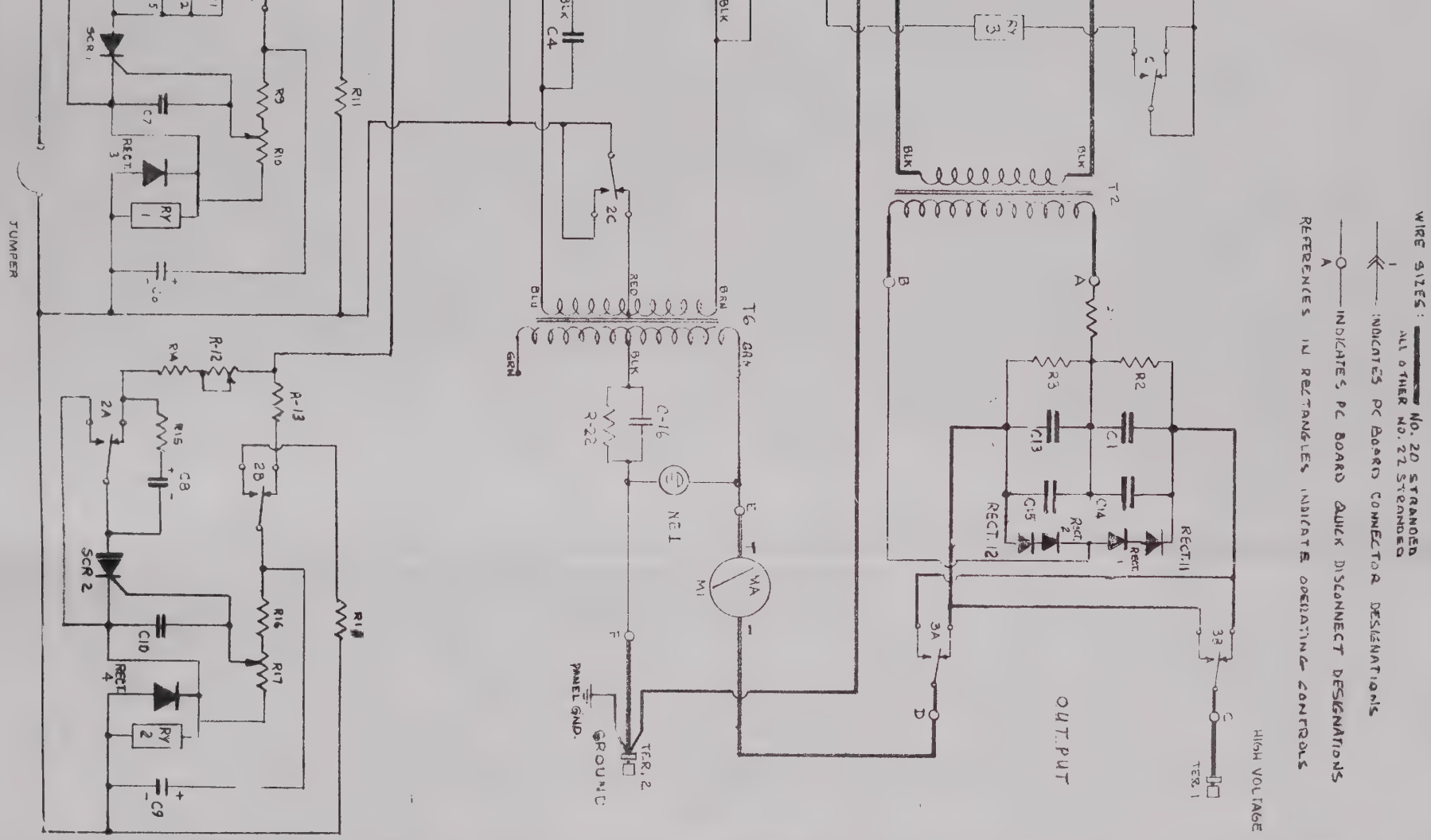
4.22.91	BS	LS
11.25.91	BS	LS

ECO 4448

SEE SHEET 1.

SEE SHEET 1

DWG-CWIS 1



LET.	CHANGE	DATE	BY	APP.
F	SEE SHEET 2 FOR REV.	4.22.91	JF	LS
E	SEE SHEET 4 FOR REVISION -	9-26-84		
D	Sheet 2 FOR Change	11/7/83	DD	
C	CHANGED PARTNUMBER OF BATTERY P/N 33335 WAS 16652	1/24/83	DD	
B	ADDED SYMBOL IDENT. SHT 2 OF 4	9/1/81		
A	ORIGINAL ISSUE			

ASSOCIATED RESEARCH, INC.
3758 WEST BELMONT AVENUE, CHICAGO, ILLINOIS 60618

TOL.

Schematic Wiring Diagram
TRANSMITTER Section
Model 855 Cable Locator/Fault Finder

DWN. GP | APP.
CKD. | SHT. 1 OF 4

DWG-CWD-B 10 3

HSE 10 9535

B-10633

USED ON

MODEL 08500A XMITTER

SYMBOL IDENTIFICATION MODEL 08500A TRANSMITTER

SYMBOL	PART NUMBER	ASSEMBLY	SYMBOL	PART NUMBER	ASSEMBLY
T-1	11654	08500A-10	R-1	16672	08500A-12
TR-1	11818	08500A-10	R-4	16787	08500A-12
I-1,2	16437	08500A-10	R-22	16815	08500A-12
TR-2	17478	08500A-10	C-7,10	17466	08500A-12
S-1,2	17911	08500A-10	R-6,12	17721	08500A-12
M-1	18290	08500A-10	R-10,17	17724	08500A-12
CA-1	18376	08500A-10	RY-1,2	17910	08500A-12
T-2	18433	08500A-10	R-13	18273	08500A-12
F-1	50108	08500A-10	T-3	18294	08500A-12
S-3	59690	08500A-10	C-2,3,5,11,12	18300	08500A-12
NE-1	11812	08500A-10	C-6	18301	08500A-12
C-16	10425	08500A-12	C-8	18302	08500A-12
RT-3,4	14503	08500A-12	T-4	18304	08500A-12
R-9,16	14791	08500A-12	SCR-1,2	18311	08500A-12
R-5	14812	08500A-12	RT-5,6	18329	08500A-12
R-8,11,15,18	35551	08500A-12	C-1,13	18454	08500A-12
R-7,14	15294	08500A-12	C-9	18498	08500A-12
			C-14,15	18633	08500A-12
RY-3	16568	08500A-12	RECT.-1,2,11,12	34933	08500A-12
T-6	36892	08500A-12	R-19	58334	08500A-12
C-4	16658	08500A-12	T-5	18328	08500A-13

LET.	CHANGE	DATE	BY	APP.
H	DELETED R-20, R-21. CHANGED R-10, 17 FROM 17723 TO 17724	11-25-91	BS	LS
G	RECT.-1,2 CHANGED FROM 30299 TO 34933 ADDED RECT.-11,12 34933.	42291	JF.	LS
F	T6 CHANGED FROM 16640 TO 36892	3.29.91	jf	LS
E	SEE SHEET 4 FOR REVISION..	9-26-84	[illegible]	R
D	P/N 35551 WAS 15230	11/7/83	DD	R
C	CHANGED P/N OF BATTERY P/N 35335 WAS P/N 16652	1/24/83	DD	[illegible]
B	ADDED SYMBOL IDENT. SHT 2 OF 4	1/29/81	EB	[illegible]
A	ORIGINAL ISSUE			

* REPLACES MODEL 8500

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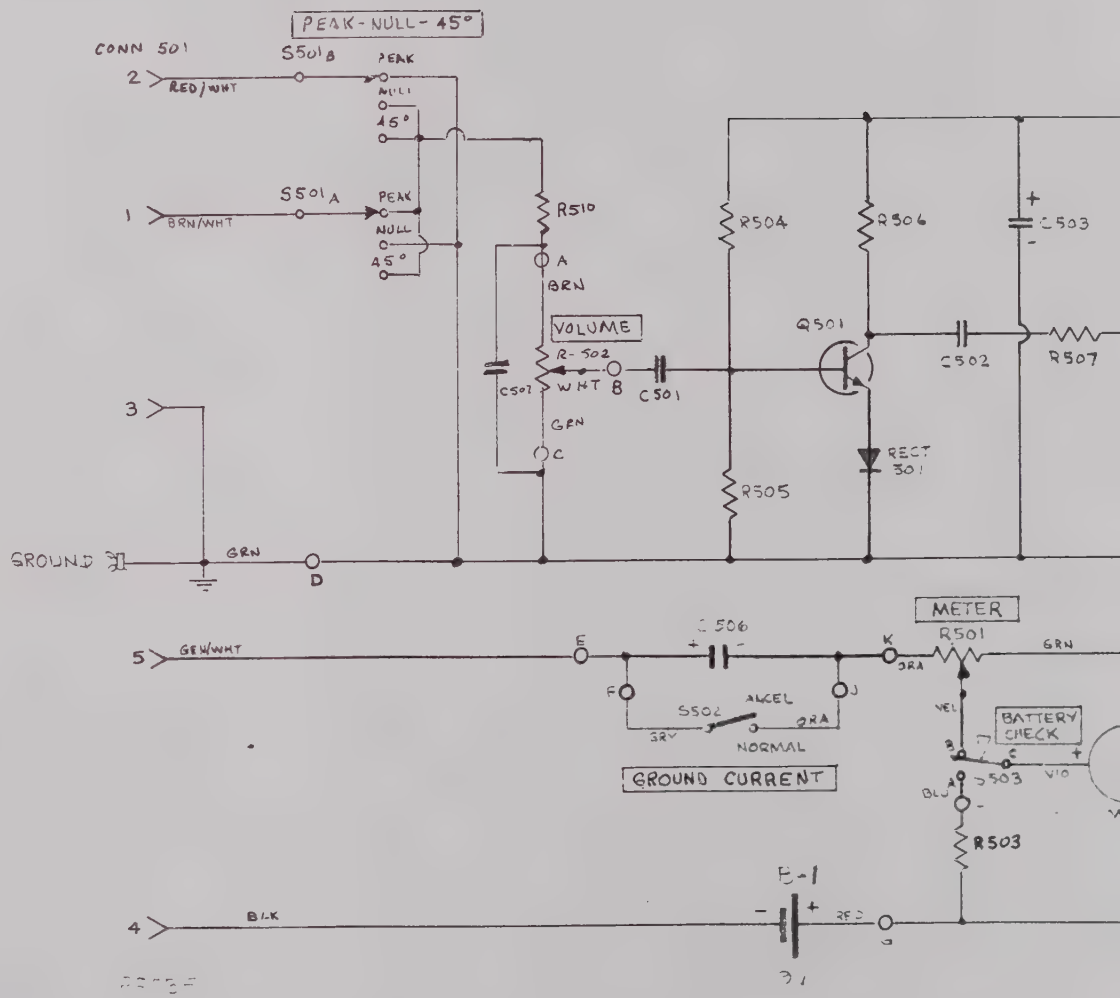
TOL.

SCHEMATIC WIRING DIAGRAM
* MODEL 08500 A CABLE LOC. / FAULT FINDER
TRANSMITTER SECTION

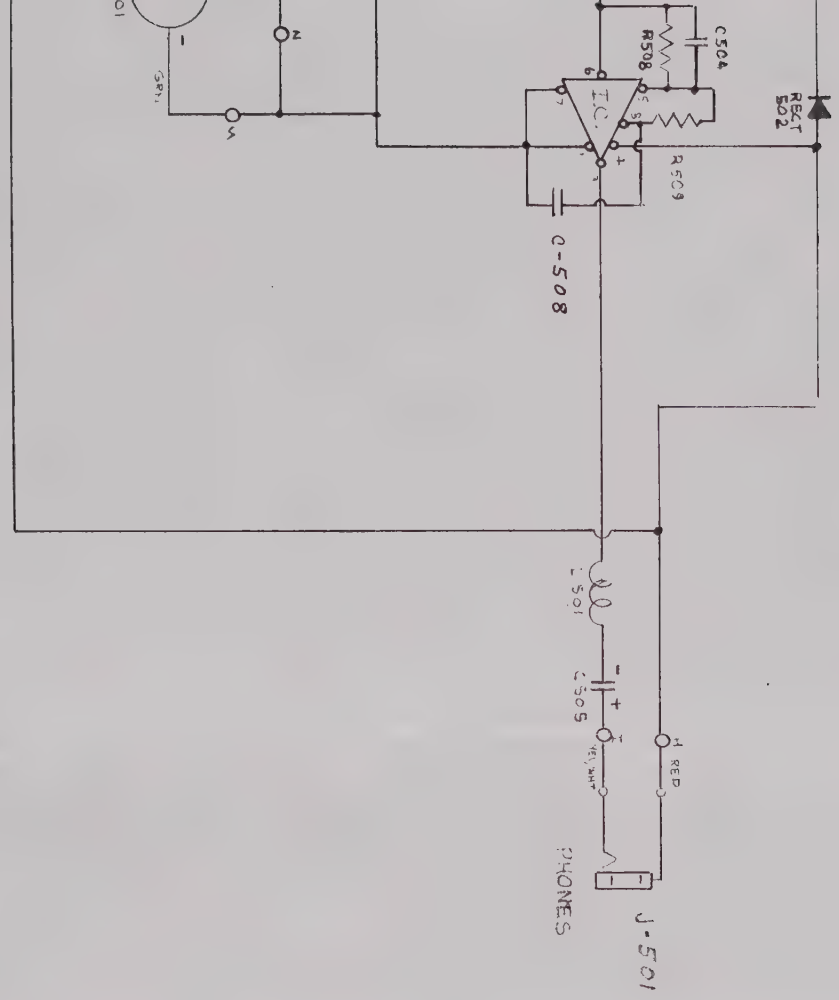
DWN. | APP.
CKD. | SHT. 2 OF 4

B 10633-H

USED ON
8500-371



DWG # 10034



REFERENCES IN RECTANGLES INDICATE OPERATING CONTROLS.

ALL WIRE NO 22 STRANDED

* REPLACES MODEL 8500 DETECTOR.

LET.	CHANGE	DATE	BY	APP.
F	SEE SHEET 2 FOR REVISION			
E	SEE SHEET 4 FOR REVISION. -	9-26-83		
D	See Sheet 2 For Change	11/7/83	DD	
C	CHANGED PIN OF BATTERY PIN 35335 WAS PIN 16652	1/24/83	DD	
B	ADDED SYMBOL IDENT. SHT 4 OF 4	1/30/81	EB	
A	ORIGINAL ISSUE	3-1-72	DS	

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TOL.

SCHEMATIC WIRING DIAGRAM
* MODEL 8500A DETECTOR

DWN. GP | APP.
CKD. | SHT. OF 4

DWG CWD F

K-E 10 9335

B-10633

USED ON
08500 A
DETECTOR

SYMBOL IDENTIFICATION MODEL 08500A DETECTOR

SYMBOL	PART NUMBER	ASSEMBLY
S-502	15552	08500 A - 08
S-503	15588	08500 A - 08
B-1	35335	08500 A - 08
J-501	17193	08500 A - 08
CN-501	18203	08500 A - 08
M-501	18291	08500 A - 08
R-502	18308	08500 A - 08
R-501	18307	08500 A - 08
RT-501, 502	14503	08500 A - 09
C-508	15915	08500 A - 09
C-507	16360	08500 A - 09
L-501	17630	08500 A - 09
S-501	18310	08500 A - 09
C-501, 502	18312	08500 A - 09
C-503	18313	08500 A - 09
IC	18315	08500 A - 09
Q-501	18316	08500 A - 09
R-504	18372	08500 A - 09
R-505	18373	08500 A - 09
R-506	18374	08500 A - 09
R-507, 509	18375	08500 A - 09

R-503	18445	08500A-09
C-505, 506	18945	08500A-09
C-504	18970	08500A-09
R-508	18371	08500A-09

* REPLACES MODEL 8500 DETECTOR

LET.	CHANGE	DATE	BY	APP.
F	SEE SHEET 2 FOR REV.			
E	R-501 WAS P/N. 18308; R-502 WAS P/N. 18307	9-26-84	PZ	R
D	See Sheet 2 For Change	11/7/83	DD	R
C	CHANGED PIN OF BATTERY PN 35335 WAS 16652	1/24/83	DD	R
B	ADDED SYMBOL IDENT SHT 4 OF 4	1/30/81	EB	NLK
A	ORIGINAL ISSUE			

ASSOCIATED RESEARCH, INC.
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TOL.

SCHEMATIC WIRING DIAGRAM

* MODEL 08500A - DETECTOR

DWN. | APP.

CKD. | SHT. 1 OF 4

B-10633-

MP MASTER
MA30123